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# Methodology proposal to access cross-functional collective activities of external radiotherapy

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**Abstract.** In this paper we aim to present the methodology used in an Ergonomics research work to define the preparation for treatment in external radiotherapy. This research work concerns the analysis of the preparation for treatment in external radiotherapy activity and the difficulties workers are experiencing. Lack of fluidity during this step and between the different actors was noted by the IRSN (Institute for Radioprotection and Nuclear Safety) experts and the ASN (Nuclear Safety Authority). IRSN assumes that those lacks of fluidity may have an impact on workers activity and patients' safety. IRSN formulated a thesis subject on the basis of this hypothesis called "Human activity and transverse performance, the case of preparation for treatment in external radiotherapy".

**Keywords:** Radiotherapy, Process modelling, Team work.

## 1 Fluidity and collective activity in external radiotherapy

The first step of this research work was carried out in an external radiotherapy center to better understand what the preparation for treatment in external radiotherapy is, what fluidity is and the link between lacks of fluidity and patients' exposure to risk. According to the IRSN, the preparation of radiotherapy treatment presents lacks of fluidity qualified as a hazard. Let us consider that fluidity corresponds to an uninterrupted progression. The initial study has shown that preparation falls within the patient's global care, it is divided in interdependent steps, involving many trades at different times and places which contribute to its complexity (Thellier & Le Tallec, 2019). In any case, the collaboration between the different professionals and the steps in the process allows the treatment administration, this led us to qualify it as a cross-functional collective activity (Motté & Haradji, 2010; Poret et al., 2016). The field data collection performed for this study shows that there is no precise description of

the preparation step and highlights the difficulties for the care team to adjudicate on a common definition.

## 2 Methodology

We started this work with observations, interviews and documents analysis. Initially, open observations<sup>1</sup> were used to discover the environment, the process and the professionals (informal interviews). They represent 60 hours in the field and 2 hours 30 minutes in meetings. Formal interviews represent 5 hours 20 minutes. Consulting the radiotherapy center documents represents 7 hours and 30 minutes. These documents concerned for example processing procedures, human and material resources, feedback committees. Other documents were used: radiation therapy courses of the chief physicist for example. The care center database includes an “operational process cartography” (Fig.1) made by the care team. It details all the steps of the external radiotherapy process followed by this center. The first step “reception desk/secretariat” includes the creation of the patient file and the reception of the patient when he or she first presents himself or herself. The second step “Medical consultation” is the first appointment with the oncologist, who will explain to the patient and his family if they are present the course of treatment. This is also a time when the doctor asks the patient for certain information in order to establish the prescription. The third step “Appointment planning” is to plan the patient’s various appointments in the radiotherapy department for the coming days and for the treatment sessions, according to the medical prescription. The fourth step “Paramedical consultation” allows the therapy technologists to explain to the patient in detail various tips and recommendations. The fifth step “Scanner” is to take a very precise image of the patient’s body. The sixth step “Technical file’s preparation” consists in gathering technical and specific information for the preparation of the treatment (scanner, radiation dose calculation, etc.). The seventh step “Setting up/ treatment” verifies all the information necessary for the treatment and makes a first test and then delivers the treatment. The last step “End of treatment/ follow up” verifies that the treatment has gone well and monitors possible side effects.

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<sup>1</sup> These are global observations that take place initially with a broad focus.

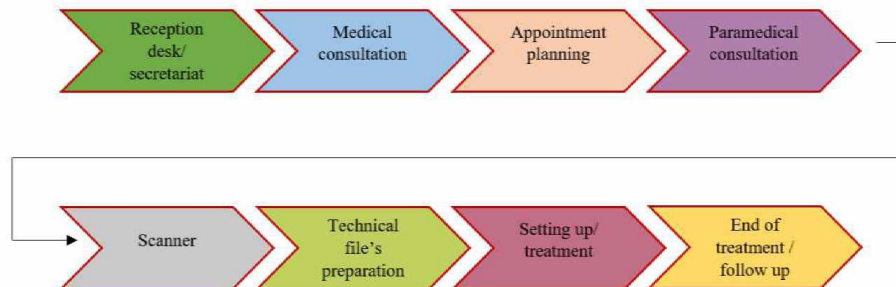


Fig. 1. “Operational process cartography” of the treatment carried out by radiotherapy department.

Exchanges with care team about the process revealed that preparation is unthought: there is no mention of it in the database and first interviews with the staff did not help to define it precisely. We elaborated a new process modelling (Fig. 2)<sup>2</sup> enriched with open observations and discussions with professionals (informal interviews) following the patient’s file process. This helped complete the cartography (additional steps) and identify elements (or sources) of variability (doctor’s adjustments, various patients’ admissions ways, treatments’ combination etc.). Elements that may have an impact on fluidity were drawn as well (orange circles).

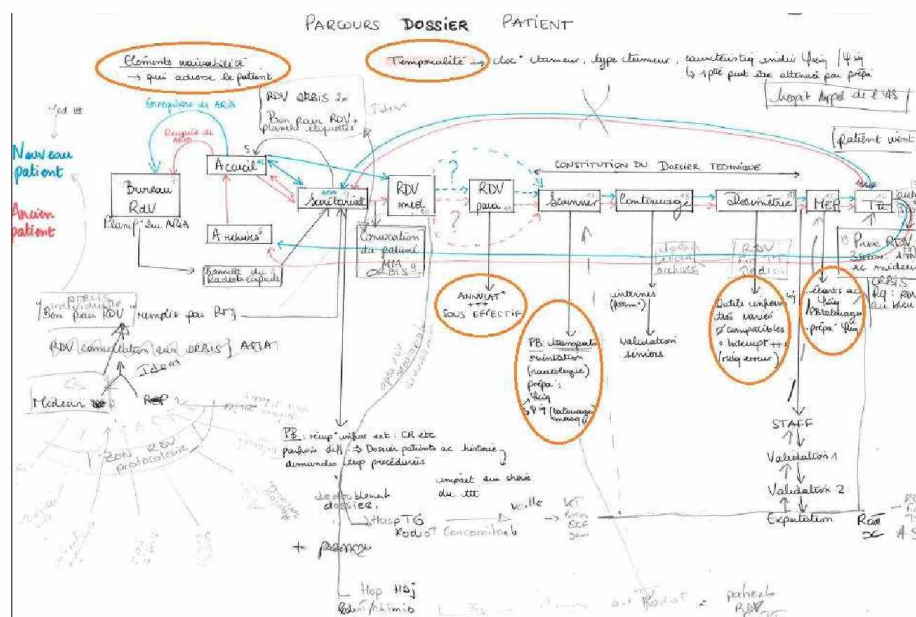


Fig. 2. Mapping of the treatment process reconstructed from the field

<sup>2</sup> Fig. 2 is an illustration, it is not a question of understanding the details, but rather of showing what jumps out in relation to Figure 1.

Because of the deadlines and objectives set beforehand, the second part of this methodology is less consequential: 3 hours of interviews and 4 hours of systematic observations. The aim of the systematic observations was to be present at a specific time and place to show and characterize the different types of interactions between professionals, which, based on open observations, would enable them to coordinate and make decisions (transmission of information via the file, by computer, by moving, over the phone, etc.). This has led us to the creation of observation grids used at a specific stage of the preparation: the scanner, and to choose two types of location (the most frequent) breast cancer and prostate cancer. Specifically, scanner steps, time, patient's file information, information given to the patient, and hazards/ delays were recorded. We added three clarifications in the information entered in the patient's file: the information that the therapy technologist retrieves, the information that he gives to his colleagues and the stage of the care process concerned by this information.

For the following collective or individual interviews, we decided to discuss this new modelling highlighting the instrumentation of analyses. Given time and organizational pressure we did collective interviews only between people practicing the same trade. Different types of interactions were noticed during the discussions about the process modelling in collective or individual interviews. The trades that participated in these interviews were therapy technologists, administrative medical assistants, one radiation oncology physicist and one caregiver. Some of them used the process modelling to debate between them first and then with the ergonomist, it became an intermediate object (Vinck, 2009) in the analysis work. Another professional (administrative medical assistant) added variability elements (above mentioned) by taking the sheet on which the process was modeled and writing on it. Then he explained it to the ergonomist. The co-construction of this new way of looking at the process therefore took place in the field with the professionals. In the absence of consensus on the definition of preparation it was decided to conduct additional, exploratory interviews with the various trades involved in several different establishment. According to the professionals met during the internship, the organization and type of institution (private/public) could play an important role in the preparation (different deadlines between private and public) and in the fluidity of the process (difficulty to recover data, more or less flexible procedures). This can cause rushed work phases that can generate errors or delays in the start of treatment, eventually impacting the chances of remissions.

### **3 Results**

The modelling highlights that preparation activity is a cross-functional collective activity difficult to delimit because professionals do not give the same contour and content of it. However this modelling allows to identify multiple types of preparation we can divide in two parts: preparation's object and types of treatment. The type of treatment chosen by the oncologist will have an impact on the object of preparation. The treatment chosen can be a classical treatment (carried out within the recommend-

ed timeframe depending on the location and stage of the tumor), an emergency treatment (carried out within 24 hours to relieve the patient's pain), a re-irradiation (the patient has already received external radiotherapy in the past but the tumor has returned for example) etc. The objects of the preparation that will be impacted by these types of treatment are for example: patient's preparation, machines' preparation, medical files' preparation. For example, the preparation of the patient consists in making him or her an actor in his or her own care. To do this professionals "educate" the patients: be punctual at the sessions, do not move on the scanner table and later treatment, for some treatments come with a full bladder, do not eat certain foods. According to interviewed professionals, lacks of fluidity are hazards happening during preparation: the breakdown of a machine, a patient who does not come to a session etc. And these hazards can then cause an acceleration of the process or a slowing down or even a stoppage. This methodology was the occasion to put into debate what preparation is and transform professional's point of view about the process and the preparation during collective interviews by accepting colleagues' arguments and point of view for instance. It has also shown the difficulties that can be encountered in describing a process and that defining or characterizing a theoretical process leads to simplifying a real process, and making its diversity and variability "invisible".

## 4 Discussion

The originality of this work is double: to focus on the preparation of the treatment and fluidity associated (Munoz, 2016; Nascimento, 2009; Pernet, 2013; Thellier, 2017); and to include professionals in the process modelling. They therefore participate in part of the analysis of the activity, which is different from certain approaches where the ergonomist provides a diagnosis that will serve as a starting point for discussions and then co-construct solutions (Casse & Caroly, 2017). This methodology is designed to meet a need to better understand the complexity of the real care process in its entirety (Motté & Poret, 2018) because it concerns several professionals in many times and places with multiple care protocols, method etc. According to Van Belleghem (Van Belleghem, 2014) this freedom to create an original methodology is possible because this work is part of a research having "low constraint to the exercise" supporting a high "practices' diversification potential".

## 5 Conclusion

This methodology integrating early in the work analysis the participation of professionals in external radiotherapy was developed to face the difficulties to define the preparation on the field and in institutional and professional documents. It helped collecting lots of information useful to the ergonomist comprehension and for radiotherapy professionals and to put in debate what preparation is. It has to do not only with methodology but also with results showing a new perspective on care process.

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